

(No Model.)

R. & F. GARRETT.
TUBULAR BOILER AND FURNACE.

No. 259,845.

Patented June 20, 1882.

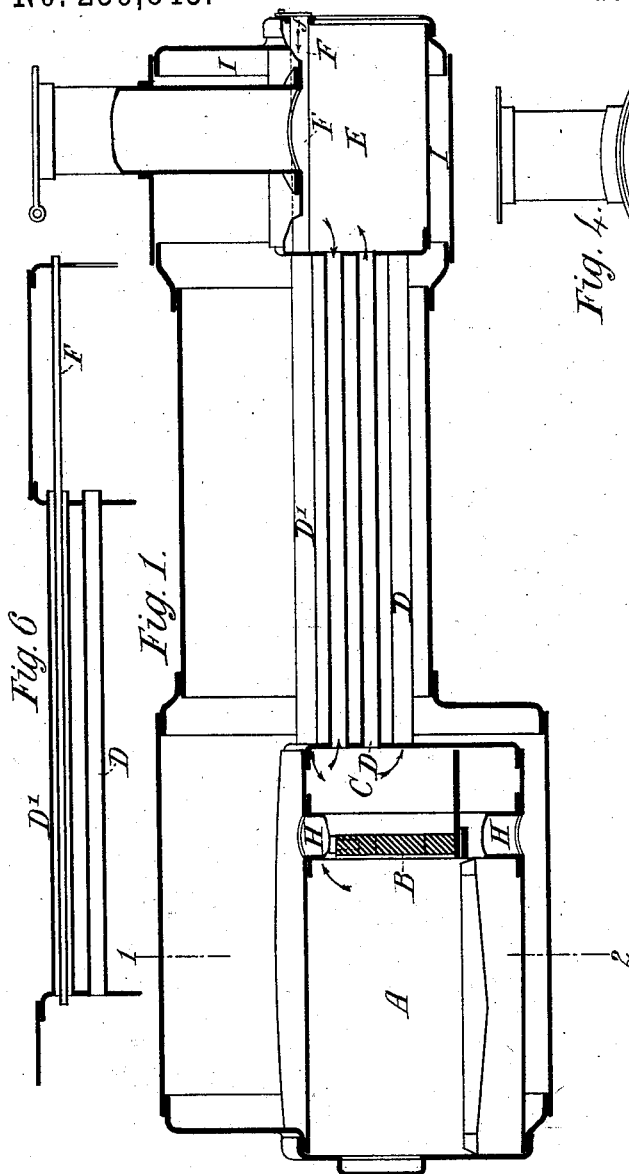


Fig. 4.

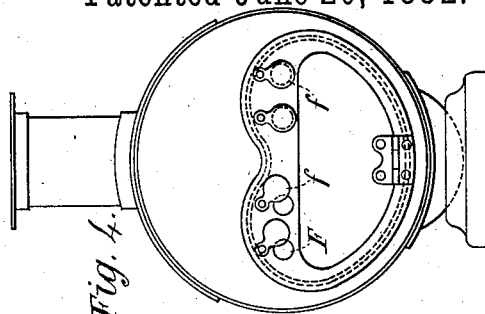


Fig. 5.

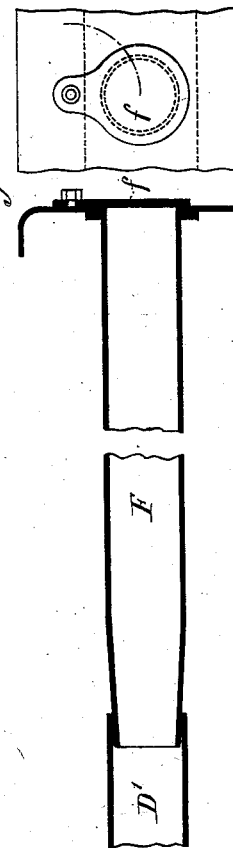


Fig. 2.

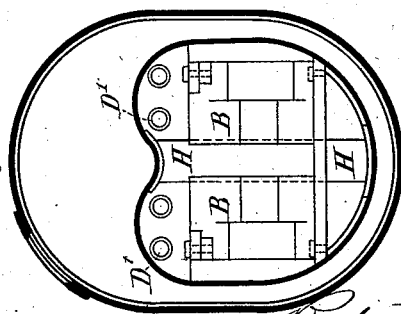
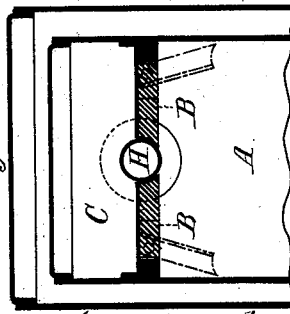


Fig. 3.



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UNITED STATES PATENT OFFICE.

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TUBULAR BOILER AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 259,845, dated June 20, 1882.

Application filed June 13, 1881. (No model.) Patented in England March 11, 1881, No. 1,060; in France July 7, 1881, No. 143,840; in Germany July 8, 1881, No. 16,701; in Austria July 9, 1881, No. 16,890; in Belgium July 21, 1881, No. 55,222, and in Italy July 25, 1881, No. 13,192.

To all whom it may concern:

Be it known that we, RICHARD GARRETT and FRANK GARRETT, both of Leiston Works, Leiston, in the county of Suffolk, England, have invented certain Improvements in the Construction of Tubular Boilers and Furnaces, of which the following is a specification.

The chief object of this invention is to effect an economy in the consumption of the fuel burned in the furnaces of tubular steam-boilers, and also the prevention of smoke and the arrest of sparks and solids arising from the burning fuel—as, for instance, the silicious deposit emanating from burning straw.

The invention relates to portable and locomotive-engine boilers, the fire-tubes of which lie horizontal and lead directly from the combustion-chamber to the smoke-box.

In applying our invention to portable or locomotive boilers we cut off from the furnace the combustion-chamber by extending the bridge, or a screen which serves the purpose of a bridge, to a height approaching near to the crown of the furnace, and extending through the boiler at a slightly-lower level than the crown of the furnace is a row of air-tubes, which reach from the tube-plate of the combustion-chamber to and through the smoke-box. The outer ends of these tubes are open to the atmosphere, and they serve to draw in air and convey it in a heated state to the combustion-chamber for the purpose just explained.

In the accompanying drawings, Figure 1 is a longitudinal section of the boiler and furnace of a portable engine with our improvements adapted thereto. Fig. 2 is a cross-section taken in the line 12 of Fig. 1 or through the furnace. Fig. 3 is a partial sectional plan of the furnace, and Fig. 4 is an elevation of the smoke-box end of the boiler.

In these figures, A is the furnace, B is the bridge, and C the combustion-chamber.

D D are the fire-tubes leading from the combustion-chamber through the barrel of the boiler and ending in the tube-plate of the smoke-box E.

The bridge B is composed of two vertically-hinged doors, which are made of frames of iron

faced with fire-brick. These doors are capable of being swung back, as indicated by dots in Fig. 3, to expose the ends of the fire-tubes for cleaning and repairs. The bridge B, it will be seen, rises near to the crown of the furnace and near the level of the top row of fire-tubes. These tubes (marked D') we now propose to convert into air-tubes by inserting into their forward ends short tubes F F, which extend to the front of the smoke-box and are made fast to the end plate thereof. These tubes F are open to the atmosphere, and their inner ends are drawn down, so as to enable them to fit tightly in the tubes D'. Air-passages are thus established between the smoke-box end of the boiler and the combustion-chamber, and when the fire is burning and a sufficient draft is established in the fire-chamber air will be drawn in through these tubes, heated by the gases in the smoke-box, and supplied to the combustion-chamber. In front of the outer ends of these tubes are hung small swing regulating doors or gates f, which, when dropped into place, as best shown in the enlarged views, Fig. 5, will close the tubes and prevent smoke escaping therefrom when the furnace-fire is first ignited. So soon, however, as the furnace becomes hot, these doors f are to be raised sufficiently to admit an adequate supply of air, which will pass into and through the tubes F to the combustion-chamber.

We prefer to connect the steam and water space above the crown of the furnace, by a pipe, H, in the vertical plane of the bridge, with the water space or jacket below the ash-pit. This is for the purpose of keeping up a good circulation of water in the front part of the boiler; but the tube also serves as a stay for the crown of the furnace and as an abutting piece for the hinged doors which form the raised bridge B.

The smoke-box is surrounded by a water-jacket, I I, through the upper part of which the chimney is sunk to meet the corrugated crown of the smoke-box, to which it is riveted. Thus a large increase of heating-surface is provided, and the gases of combustion, being robbed of much of their heat by the surround-

ing water and by the air-tubes F, are caused to leave the boiler at a comparatively-low temperature.

This arrangement of boiler and furnace is intended especially for burning light fuel—such as straw and stubble—which require for their efficient consumption not merely the use of a combustion-chamber, (the transverse wall or partition forming which serves to deflect the flame and particles of unconsumed fuel and prevent their direct entrance into the fire-tubes,) but also require the supply of heated air to impinge upon the flame as it rises over the bridge. When, however, it is desired to heat boilers of the ordinary locomotive type by a fuel which is not so liable as straw to form, while burning, a deposit in the combustion-chamber, and which is slower of combustion and requiring a more extensive grate-area, the fire-bridge may be removed, and the air-tubes D' may be converted at pleasure into fire-tubes by simply removing the small tubes F and closing the openings made for them in the end of the smoke-box by the means above described.

As a modification of the means employed for delivering heated air to the combustion-chamber, we propose in some cases to adopt the arrangements shown in the sectional view, Fig. 6, where the row of fire-tubes D' have inserted in them air-tubes F, which extend from the tube-plate of the combustion-chamber through the fire-tubes and through the smoke-box. These tubes will be open at both ends and will be held centrally or otherwise in their containing tubes by feathers or their equivalent.

We are aware that it is old to introduce air into the combustion-chamber of a steam-boiler to produce a more perfect combustion; and we are also aware that air has been introduced into the fire-tubes of a boiler by means of an

injector or series of steam-jets. Hence we do not claim the above as of our invention.

What we do claim as our invention, and desire to secure by Letters Patent, is—

1. The combination, with the raised bridge B and the tubes D', situated at or immediately above the level of the bridge and extending from the combustion-chamber to the smoke-box, of the tubes F, extending through the smoke-box and entering the tubes D', whereby the combustion-chamber is brought into communication with the open air and streams of heated air are caused to meet and mingle with the gases of combustion as they rise over the bridge to reach the combustion-chamber, substantially as specified.

2. The raised bridge B, constructed of abutting doors, which are hinged vertically on opposite sides of the furnace, and which afford, on being thrown back, ready access to the flue-tubes for cleaning and repair, substantially as specified.

3. The combination, with the furnace having the circulating-pipe H, extending from top to bottom thereof, of the bridge-wall B, composed of two doors hinged vertically at the opposite sides of the furnace and closing against said pipe, substantially as specified.

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